

introducing a fluorocarbon gas into the reaction chamber, wherein the fluorocarbon gas contains at least one of  $C_4F_6$ ,  $C_5F_8$ , and  $C_6F_6$  gases; and

creating a plasma from the fluorocarbon gas and etching the silicon dioxide film with the plasma,

wherein a residence time  $\tau$  of the fluorocarbon gas in the reaction chamber is controlled at a value greater than 0.1 sec and equal to or less than 1 sec, the residence time  $\tau$  being given by  $P \times V/Q$ , where  $P$  is a pressure (unit: Pa) of the fluorocarbon gas,  $V$  is a volume (unit: L) of the reaction chamber and  $Q$  is a flow rate (unit: Pa · L/sec) of the fluorocarbon gas.

4. (Amended) A plasma processing method comprising the steps of:  
placing a substrate inside a reaction chamber of a plasma processing system, a silicon dioxide film having been formed on the surface of the substrate;

introducing a fluorocarbon gas into the reaction chamber, wherein the fluorocarbon gas contains at least one of  $C_4F_6$ ,  $C_5F_8$ , and  $C_6F_6$  gases; and

creating a plasma from the fluorocarbon gas and etching the silicon dioxide film with the plasma,

wherein  $PxW_0/Q$  is controlled at a value greater than  $0.8 \times 10^4 \text{ sec} \cdot \text{W}/\text{m}^3$  and equal to or less than  $8 \times 10^4 \text{ sec} \cdot \text{W}/\text{m}^3$ ,  $PxW_0/Q$  being a product of a residence time  $\tau$  of the fluorocarbon gas in the reaction chamber and a power density  $P_i$  of power applied to create the plasma, the residence time  $\tau$  being given by  $PxV/Q$ , where  $P$  is a pressure (unit: Pa) of the fluorocarbon gas,  $V$  is a volume (unit: Pa · L/sec) of the fluorocarbon gas, the power density  $P_i$  being given by  $W_0/V$ , where  $W_0$  is a magnitude (unit: W) of the power and  $V$  is the volume (unit: L) of the reaction chamber.

7. (Amended) A plasma processing method comprising the steps of:  
placing a substrate inside a reaction chamber of a plasma processing system;  
introducing a fluorocarbon gas into the reaction chamber, wherein the fluorocarbon gas contains at least one of  $C_4F_6$ ,  $C_5F_8$ , and  $C_6F_6$  gases; and  
creating a plasma from the fluorocarbon gas and depositing an organic film on the substrate using the plasma,